



<http://www.mds.com>

APM IMMERSIVE AUDIO DECODERS

Easy to use software and hardware-compatible surround audio subsystems

Momentum Data Systems' second-generation Audio Processor Modules (APM™) provide high performance off-the-shelf audio processing solutions for OEMs needing a high-quality, quick time-to-market solution.

With the advent of immersive audio systems using Dolby ATMOS™, DTS:X™ and Auro-Codec™, the designers of equipment like Audio Video Receivers (AVRs) and soundbars are faced with the task of creating a range of systems with vastly different capabilities ranging from basic 5.1 systems through complex 22+ channel system with a rich feature set.

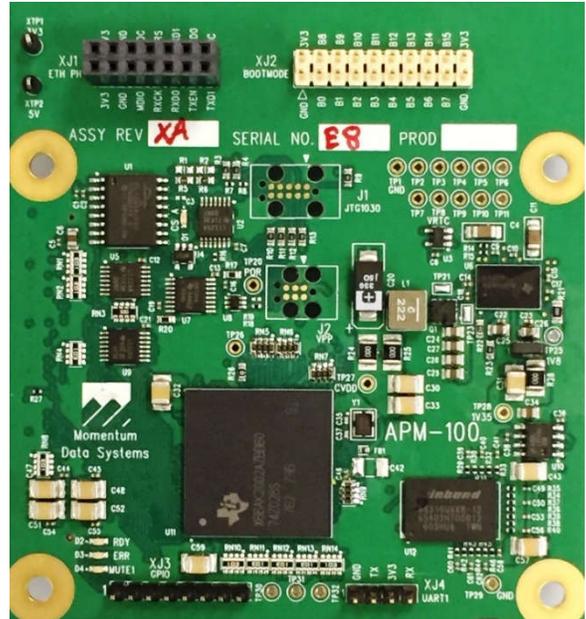
MDS' new module product line simplifies the engineering needed by offering a consistent hardware and software interface across all modules.

APM modules offer the capabilities necessary to support this entire range of products.

- Hardware modules
- Intuitive software interface
- Complete EVM
- I2C control
- I2S or I8S audio I/O
- Hardware design can be licensed.

Solution Hardware

MDS offers three basic hardware platforms. Each of these can be ordered as a module or licensed for integration into a more complete design.



APM-100/110: two speed-grades of single-DSP modules for varying channel and post-processing requirements

- The APM-100 series uses the new high-power, multi-core Texas Instruments' **K2G™** DSP with integrated ARM® Cortex-A15 processor core for supporting the latest performance audio standards at competitive prices. MDS offers three levels of performance at commensurate prices.
- The APM-89 is based on the previous generation of DA-8xx DSPs from Texas Instruments. It has been in production since 2016 and is widely used in the performance-processor channel. APM-89 offers support for Dolby ATMOS at up to 9.1.6 channels and DTS:X at up to 7.1.4 channels. Support for Auro-Codec is also available.
- The low-cost DAE-82 supports legacy Dolby and DTS decoding up to 7.3 channels.



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AV RECEIVER FIRMWARE

The APM-100 series and the APM-89 have sophisticated firmware built in to simplify the construction of an AV Receiver. They expose MDS' "AVC" interface and handle much of the control and signaling required to achieve Dolby and DTS compliance internally.

The DAE-82 exposes a lower level interface. MDS provides an example evaluation/development system (*EVMD*) that demonstrates with source code how to interface an HDMI repeater to the MDS decoder module to create a complete system.

AVC UI

The "AVC UI" is a simple "command line" interface typically implemented over I2C. These commands correspond to common actions like defining speaker capabilities, setting bass management operation and all of the other features required of an AVR.

Status is reported to identify stream sources in accordance with certification requirements. This simple interface hides the massive complexity of the latest 3D audio formats and the post-processing associated with them.

LICENSING

The hardware and software that make up these modules can be licensed for production by other manufacturers. The hardware modules can be licensed for inclusion in derived products.

DECODERS

- Dolby ATMOS, Dolby TrueHD® and Dolby Digital Plus®
- DTS:X, including DTS-HD MA®, DTS-ES 96/24®, DTS 5.1®
- AAC decode (ISO/IEC 13818-7:19975.1.0.0)
- Auro-Codec®
- DSD (APM-1xx only)

UPMIXERS

- Dolby Surround®
- DTS Neural-X®
- AuroMatic®
- MDS MST Multispeaker mono or stereo

SIGNAL PROCESSING

- Bass Management
 - per speaker control.
 - up to 5 subwoofers.
 - 4th order Linkwitz-Riley crossovers.
 - Double bass modes.
 - Stereo or mono subwoofers.
- PEQ - Parametric EQ
 - up to 32 biquads/channel,
 - standard PEQ or arbitrary designs.
- SRC - Sample rate conversion (2:1, 4:1)
- Signal/Noise generator
- DM – Downmix
- TC - Tone controls
- CLI - Clip/level indicator for PCM
- DRC - Dynamic Range Compression for night modes and /or speaker limiting

ADVANCED SIGNAL PROCESSING

(available on APM-110 and APM-120)

- Custom Crossover Design - Simple creation of higher order active crossovers for bi-amp and sophisticated bass management.
- FIR filter module - Supports room correction algorithms such as DiracLive®.

CUSTOM SIGNAL PROCESSING

MDS can work with clients to deploy customized signal processing capabilities in these modules. Customers can set their own level of involvement ranging from contracted development to direct access to the DSP code.



CREATING THE AUDIO SYSTEM

MDS' EVMD provides for IO and power so as to function as a minimal system. A complete product must add appropriate power supplies, front and rear panel hardware, control processor(s), signal switching, ADCs and DACs. The specific digital audio interfaces for HDMI and S/PDIF will be needed.

Also required are external volume controls that have an artifact-free MUTE (for example the CS3308) as well as circuitry to prevent power on/off transients on analog outputs.

The control interface to the APM modules is I2C, with a reset in and an interrupt output to the host. An SPI interface is used for software update. During development access to a UART port on the module is needed.

EVALUATION SYSTEM

Getting started with MDS APM products is as easy as ordering an EVMD development system. This system provides all of the I/O needed to evaluate the system operation.

System developers using MDS' EVMD can connect the module's I2C control to their host system and have full audio I/O capability before their own hardware is available. The host processor on the EVMD can be bypassed and connected to your host until your own system hardware is complete.

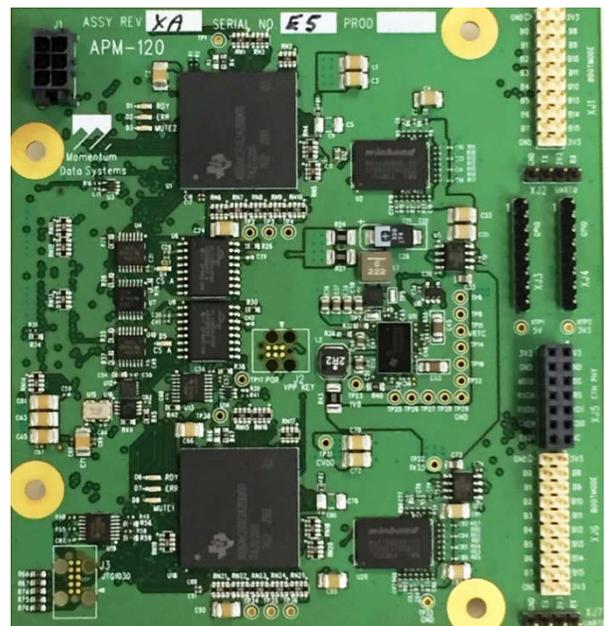
The EVMD offers HDMI I/O, 8-channel ADC, and S/PDIF inputs. It provides 16-channel analog output which is expandable to 32. Schematics and source code to the host processor (LPC1768 Cortex M3) are provided.

The EVMD provided with source code offers fast time to market with minimal development time and expense.

Please Note: Sample-Evaluation licenses from Dolby, DTS and Auro Technologies are required before MDS can ship an evaluation system that includes their respective decoder IP.



MDS EVMD Development System



APM-120 Dual 1-GHz solution

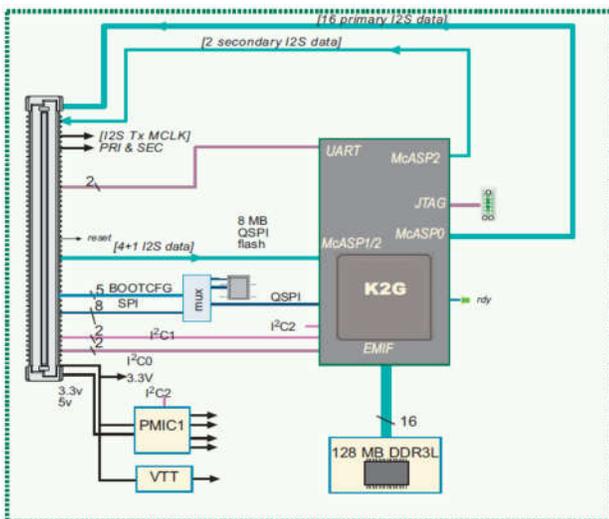


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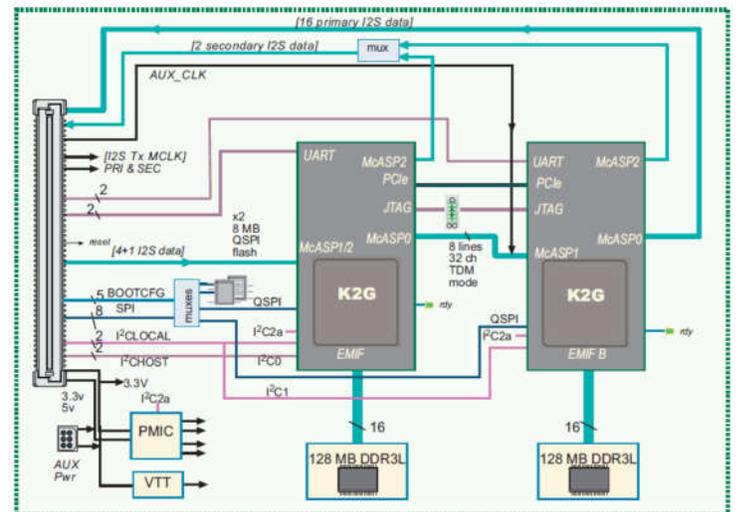
PRODUCT COMPARISON TABLE

	DSP	Decoders	Output Channels	Representative Output Configurations	Bass Manager	PEQ*	Room Correction	Secondary Output
	Single							
APM-103	K2G, 600-MHz	Dolby-ATMOS, DTS:X	16 or 24	11.5.8	4 th Order L-R	per channel	NO	YES
APM-117	K2G, 1.0 GHz	Dolby-ATMOS, DTS:X, Auro-Codec	24	11.5.8, 13.3.8, 15.1.8, 13.1.10	4 th Order L-R or custom	More bands	DiracLive®	YES
	Dual							
APM-120	K2G, Dual 1.0 GHz	Dolby-ATMOS, DTS:X, Auro-Codec	Up to 32	15.5.10, 17.3.10, 19.3.10, etc.	4 th Order L-R or custom	32 Bands Per channel	DiracLive®	YES
APM-89	DA-830 DA-810 456Mhz each	Dolby-ATMOS, DTS:X, Auro-Codec	16	7.3.4, 9.1.6	2 nd Order	6 Bands Per channel at load	No	YES

*The total number of bands available depends on loading. It is higher with more powerful DSPs.



APM-100/110



APM-120

Dolby ATMOS is a registered trademark of Dolby Laboratories, Inc.
 DTS:X is a trademark of Digital Theater Systems, Inc.
 K2G is a registered trademark of Texas Instruments, Inc.
 Dirac Live is a trademark of Dirac Research AB
 Auro-Codec and Auromatic are registered trademarks of Auro Technologies NV
 ARM is a registered trademark of ARM Limited
 APM is a trademark of Momentum Data Systems, Inc.

APM-2nd Gen Rev5 2019-Preliminary-Specifications subject to change.